# METHOD FOR DETERMINING OR CHECKING MATERIAL CHARACTERISTIC DATA OF A COMPONENT

## Technical Field

The present invention relates to a method for determining or checking material characteristic data of a component consisting of fiber reinforced material, in particular of fiber reinforced plastic.

## Prior Art

Methods for determining or checking material characteristic values of a component are basically known and are used in the sphere of testing the quality of components in the context of material testing methods.

In order to carry out testing of the material of fiber reinforced components, usually representative components are removed from a production series and are sawn up into individual test pieces. The test pieces obtained in this manner are then tested in a manner destroying them, in order to determine or check the material characteristic values and/or material quality of the components. However, in the case of this known material testing method, the component to be investigated is completely destroyed, making it impossible to use it further. This firstly increases the outlay on material and the production costs for the components, since additional components have always to be produced for the material testing. Secondly, the destructive testing means that it is not possible to investigate components which are used in practice and are used, for example, for the construction of a structure to be produced, such as, for example, a freight car body of a rail vehicle. However, since the properties and material characteristic data of fiber

reinforced components are influenced essentially not only by the materials used, but also by the processing parameters, such as, for example, pressure and temperature, exact material data can be determined only on a finished component. The material characteristic data and material quality values ascertained on the components which are tested in a manner destroying them are therefore merely to be regarded as representative values for a component used in practice. A definition of the precise material characteristic data, which can only be carried out on the finished component being used, cannot be achieved by the known method.

Summary of the Invention

In view of these disadvantages and remaining problems in the case of the methods known in the prior art for determining or checking material characteristic values of a component consisting of fiber reinforced material, the present invention is based on the object of providing a method in which an exact and reliable definition of the material characteristic data and/or of the material quality of a component used in practice is ensured with little outlay on labor and time and little outlay on material.

This object is achieved by the method according to patent claim 1.

Accordingly, first of all a finished component consisting of fiber reinforced material, in particular of fiber reinforced plastic, is provided. In this case, the component is preferably finished in such a manner that it has a shape and size required for installing it into a structure to be produced. Furthermore, the component to be investigated may also already be installed and be part of the structure. The provision of the finished component, which is being used in a

structure, for the determination of the material characteristic data results in the great advantage that the material characteristic values and/or the quality of the component can be determined exactly. In contrast to the conventional method in which only representative comparison values for the material characteristic data can be defined on the components provided only for test purposes, this method step enables a reliable and precise ascertainment of the material data on the used component itself. Moreover, material costs are saved, since the testing of the quality on the component itself according to the invention means that production of additional components provided only for the material testing is omitted.

After the finished component consisting of fiber reinforced material has been provided for the determination of the material characteristic data and/or quality testing, statically negligible or irrelevant regions in the component are determined. These regions are determined essentially with regard to the stress states and force distributions which are present in the component in the installed state which are caused, for example, by tensile, compressive and transverse forces and by bending moments which occur. To this end, the statically negligible or non-loaded regions of the component are ascertained, i.e. those sections of the component which only absorb small forces, if any at all.

After the statically negligible or non-loaded points of the component have been defined, at least one test piece is removed from the fiber reinforced component, for example is cut out, bored out or punched out of the component. In this connection, a targeted removal of the test piece or of a plurality of test pieces takes place at at least one of the previously determined, statically negligible or irrelevant regions of the

component. The component therefore retains its static and technical material properties when the test piece is removed. An impairment of the strength, of the static construction, structure and/or load-bearing capacity of the component by the cutout which is produced in the component during the removal of the test piece is thereby effectively avoided. The component retains its original technical material properties and remains completely functional and usable with regard to its later use, for example as a fiber reinforced component for a freight car body of a rail vehicle.

After the at least one test piece has been removed, the technical material properties, such as, for example, the material characteristic data and material quality, of the removed test piece are investigated or checked. This determination of the material characteristic data and/or material quality of the component using the removed test piece considerably simplifies the carrying-out of the testing of the material. The individual test piece can be cut to dimensions suitable for testing the material in a test device and is thereby substantially simpler to handle. The data obtained during this testing of the material of the test piece are used, for example, as input variables for a subsequent calculation in construction and manufacture or else as an indication of the material quality achieved during the production of the component. This affords the great advantage that the material data defined on the test piece correspond exactly with those of the finished component, since the component and test piece are not only constructed from the same materials, but are also produced with the same processing parameters.

The present invention is based on the concept of determining the quality and material characteristic

values of the fiber reinforced component used in practice without destroying the component itself and therefore being able to make further use of it as a component. This is achieved in particular by the targeted removal of at least one test piece at a statically negligible or irrelevant region of the fiber reinforced component.

The testing method described, for investigating a component consisting of fiber reinforced material, in particular fiber reinforced plastic, can be carried out simply, rapidly and with a comparatively low outlay. In this case, an exact determination of the quality and material characteristic data on the component itself which is used in practice is made possible.

Advantageous embodiments of the method according to the invention are described in the further claims.

After the determination of the material characteristic data and testing of the quality of the fiber reinforced component, the component tested can be made further use of in an advantageous manner without the removed test piece. For example, the component tested according to the method described can be used in a structure to be produced, for example for producing a freight car body of a rail vehicle. This ensures that a fiber reinforced component having exactly defined material values is used.

It is preferable for the test piece to be tested in a manner destroying it, in order to determine the material characteristic values. This affords the advantage that material quality and/or material characteristic values of the fiber reinforced component can be determined using the test piece without destroying the component itself. The component therefore remains fully functional for its use in a

structure to be produced and can be made further use of after the testing.

According to a preferred embodiment of the method according to the invention, a cutout which arises in the component due to the removal of the test piece is closed by a filler. Since the cutout which arises in the component due to the removal of the test piece is arranged in a statically non-loaded region or in an only slightly loaded region of the component, the cutout can be closed by a simple, preferably inexpensive and/or lightweight filler, such as, for example a putty. This enables the original shape of the component to be reproduced. It is therefore ensured that the component tested corresponds not only functionally, but also visually in its external shaping to an untested component.

Brief description of the drawings

The present invention is described below purely by way of example using an advantageous embodiment and with reference to the attached drawings, in which:

Fig. 1 shows a perspective view of a component consisting of fiber reinforced material; and

Fig. 2 shows a perspective view of the component according to fig. 1 with test pieces removed, in a disassembled illustration.

Description of an embodiment of the invention

The structural component 2 which is shown in fig. 1 consists of fiber reinforced plastic. The fiber reinforced component essentially has a rectangular shape and comprises an upper leg 4 and a lower leg 6. A strut 8 is arranged laterally on the upper leg 4 and is supported on the upper leg 4 via a rib 10. In the

present case, the lower leg 6 and the strut 8 are in each case designed as hollow bodies. In contrast, the upper leg 4 and the rib 10 are in each case designed as solid parts consisting of fiber reinforced material. In this case, the individual sections of the component 2, namely lower leg 6, upper leg 4, strut 8 and rib 10, each have different wall thicknesses and structural designs. This constructive design of the component 2 results in regions in the component 2 being loaded in a statically differing manner. The component 2 is shown in its finished state and is used in the present case as a supporting or load-bearing element for the construction of a freight car body of a rail vehicle (not shown).

In the component 2 illustrated in fig. 2, core drillings 11 are carried out in order to remove test pieces 12. These core drillings 11 completely penetrate the particular wall thickness of the component 2, with the result that holes 14 are produced in the component 2. In this case, the core drillings 11 are situated at statically negligibly loaded zones of the component, such as, for example, in a corner region of the rib 10, a thin-walled end 13 and in a central region of the upper leg 4. Circular test pieces 12 are removed from the component 2 by the core drillings 11. In a following step, the test pieces 12, which have been removed from the statically negligibly relevant zones of the component 2, are transferred into a testing device (not illustrated) for determining the material quality and material characteristic values of the component 2. In the process, the test pieces 12 for testing the quality and/or determining the material characteristic data are completely destroyed in the test device. The quality of the component is ascertained in this manner using the investigated test piece 12. The static and technical material properties of the component 2 are retained when the test pieces 12

are removed, with the result that the component 2 can be used further.

In order to further use the component 2, for example as a fiber reinforced component in a freight car body (not shown) of a rail vehicle, the cutouts or holes 14 which arise in the component 2 due to the core drillings 11 are closed by an inexpensive and lightweight putty (not shown). This in turn produces a component 2, the outer shape of which corresponds to the component 2 according to fig. 1.